Opinion

Addressing the Biodiversity Paradox: Mismatch between the Co-Occurrence of Biological Diversity and the Human, Financial and Institutional Resources to Address Its Decline

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Abstract: Pressures are mounting for the adoption of a Global Biodiversity Framework that transforms conservation and sustainable use efforts worldwide. Underlying this challenge is the *biodiversity paradox*: biological diversity predominantly concentrates in the tropics, while human, institutional, and financial resources are primarily located at higher latitudes both north and south. Addressing the biodiversity paradox requires the expansion and mobilization of human, institutional and financial resources around the world. We outline a model championed by the IUCN Species Survival Commission (SSC) that builds on the Species Conservation Cycle (Assess-Plan-Act-Network-Communicate) and recognizes that most conservation action occurs at the national or local level. Various strategies are applied to this end by the partners of Reverse the Red, a global movement that ignites strategic cooperation and science-based action to ensure the survival of wild species and ecosystems. The SSC contributes to Reverse the Red through two primary strategies: National Species Specialist Groups and Centers for Species Survival. By building on existing expert networks and catalyzing efforts with established local institutions, we aim to significantly expand capacity to implement conservation action at the national level and reverse the negative trends indicated by the IUCN Red List of Threatened Species and the Red List of Ecosystems.

1. The Biodiversity Paradox

The world's conservation attention is focused on the post-2020 Global Biodiversity Framework being developed by the UN Convention on Biological Diversity [1]. Disappointment with poor delivery of the 2020 Aichi Biodiversity Targets [2] has motivated a renewed discussion that will necessarily require transformative changes across all drivers of biodiversity decline, including degradation of terrestrial and aquatic habitats, overexploitation, climate change, pollution, and invasive alien species [3]. Calls have been made for a straightforward biodiversity target that may provide clear guidance for biodiversity policy [4].

There are signs that premeditated, evidence-based conservation interventions can reverse biodiversity loss [5,6]. Overall, there is no question that current conservation efforts remain insufficient to counter the main drivers [7], but the situation would be worse without them. An analysis of the status of the vertebrates of the world showed that the rate of deterioration would have been 20% higher in the absence of conservation measures [8], while 21–32 bird and 7–16 mammal extinctions had been prevented since 1993—extinction rates during that period would have been three to four times greater without conservation [9]. Even at the level of a single institution, focused conservation efforts have led to reductions in the extinction risk of target species [10].

Evidence-based conservation interventions require data, yet biodiversity records are highly biased. Nearly 90% of terrestrial and 95% of marine ecosystems are inadequately sampled. Of all biodiversity records in global databases, 82% of them come from the USA, Australia, South Africa and seven European nations, while 18% of records come from the

96% remaining countries [11]. Furthermore, in addition to biases in geography and the biological realm, deep differences between taxonomic groups also exist; vertebrates, for example, greatly outnumber invertebrates and fungi in biodiversity databases despite the latter being far more speciose than the former [12].

Complicating matters further is what we call the *biodiversity paradox*: we lack the financial, institutional and human resources needed to fill gaps in biodiversity data in the areas with the most species [13]. A well-established pattern of the global distribution of terrestrial and freshwater animals, fungi and plants is that most species concentrate in tropical areas, gradually declining in species richness towards the poles [14–16]. In contrast, scientific capacity concentrates in developed countries [11]. Hotspots for marine biodiversity have more complex patterns than latitudinal clines but—where they fall within national waters at all—are again often concentrated in developing countries [17,18].

The biodiversity paradox is evident, for example, if we contrast global patterns of bird species diversity with the institutional and human resources that come together at the International Union for Conservation of Nature (IUCN), and the financial resources available to the world's nations.

The global distribution of the world's bird species follows the terrestrial and freshwater pattern described above: they concentrate in tropical areas and decline gradually towards higher latitudes (Figure 1a). In contrast, the distribution of experts (Figure 1b), institutions (Figure 1c) and funding (Figure 1d) follow a different pattern and concentrate in the higher latitudes (both north and south). In fact, only four of the top 15 countries in terms of bird species richness (Brazil, China, India and México) are among the top 15 in terms of experts and institutions, while none of them are among the top 15 countries in terms of funding (Table 1).
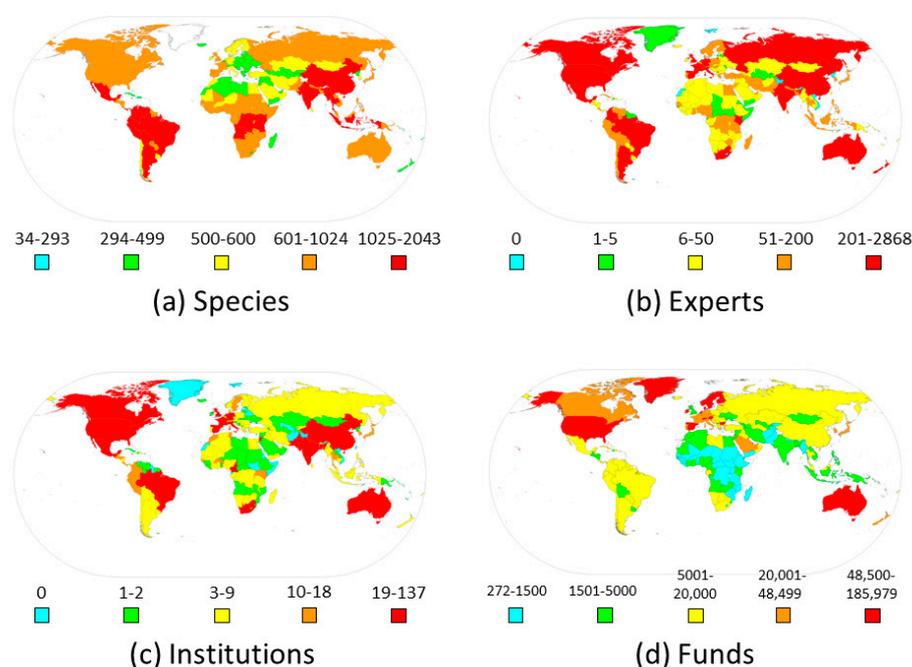

Figure 1. Global distribution of (**a**) species (bird richness per terrestrial territory), (**b**) experts (number of experts in the six volunteer IUCN Commission per country or territory), (**c**) institutions (number of IUCN Members per country), and (**d**) funds (*per capita* GDP by country in US$). Data for (**a**) were compiled from Avibase—The World Bird Database (https://avibase.bsc-eoc.org/avibase.jsp), (**b**,**c**) were provided by the IUCN Commission Support Unit, and (**d**) were compiled from World Bank national accounts data, and OECD National Accounts data files (https://data.worldbank.org/indicator/NY.GDP.PCAP.CD). Bird data for the US is for the conterminous 48 states [all data were accessed on 10 December 2021].

Table 1. Top 15 countries ranked from top to bottom according to the number of birds, experts, institutions and per capita GDP, as explained in Figure 1. In bold are the four countries in the second and third columns also present in the first one. There is no overlap between the first and fourth columns.

Birds	Experts	Institutions	*Per Capita* GDP
Colombia	United States of America	United States of America	Monaco
Brazil	United Kingdom	France	Liechtenstein
Peru	**India**	**China**	Luxembourg
Indonesia	Australia	United Kingdom	Bermuda
Ecuador	Canada	**India**	Switzerland
Bolivia	Germany	Pakistan	Cayman Islands
Venezuela	**Brazil**	Spain	Norway
China	**China**	Netherlands	Ireland
India	South Africa	**Mexico**	Iceland
Congo (DROC)	France	Jordan	Singapore
Tanzania	Switzerland	Australia	Qatar
Kenya	Italy	South Africa	United States of America
Mexico	**Mexico**	**Brazil**	Denmark
Myanmar	Spain	Canada	Australia
Uganda	Argentina	Nepal	Sweden

Addressing the biodiversity paradox requires expansion, mobilization and articulation of human, institutional and financial resources at international, regional, national and local levels, at a scale that has not been seen before [19–21]. Particularly, available funding has not reached the desired level. For example, global biodiversity financial input between 2015 and 2017 was in the order of US$ 78–91 billion per year [22], while the cost of achieving the Aichi Biodiversity Targets by 2020 would have required US$ 150–440 billion per year during the previous decade [23]. Global biodiversity funding is estimated to be only 10% of the amount required to reverse biodiversity's decline by 2030. While it is vital that public sector funding increase, we must also look to the private sector to address the funding gap, whether they be philanthropists, investors, business leaders or interested individuals [24]. Expanding human, institutional, and financial resources will require the growth of the funding base combined with strengthening existing networks of experts and organizations.

We explore how to build on the convening role of IUCN [25], synergize ideas and action with stakeholders within and outside the Union, and improve our capacity to inform evidence-based biodiversity conservation policies. IUCN is a membership union composed of State members, governmental agencies, civil society and indigenous peoples' organizations. Volunteer experts also engage in the Union through seven commissions: Climate Crisis Commission (CCC), Commission on Education and Communication (CEC), Commission on Ecosystem Management (CEM), Commission on Environmental, Economic and Social Policy (CEESP), Species Survival Commission (SSC), World Commission on Environmental Law (WCEL), and World Commission on Protected Areas (WCPA). In 2021, the number of IUCN Member organizations reached 1498, while the six Commissions combined had 18,666 experts in 212 countries and territories.

We first outline our conceptual model for growing the knowledge base needed for improving the status of species and ecosystems, and next explore how existing networks of experts and organizations may help distribute costs and move towards reversing biodiversity decline.

2. Species Conservation Cycle

The Species Conservation Cycle of Assess-Plan-Act-Network-Communicate (Figure 2) is the framework for the 160+ expert groups that integrate the SSC. Initially proposed by the SSC Cat Specialist Group, it has now been adopted to guide and structure the activities of the 10,000+ experts in SCC. The first three components flow sequentially, while the other two are transversal. *Assess* is about understanding and informing the world of the status and trends of biodiversity. It includes species and ecosystem assessments captured in IUCN Red Lists [26], but any other form of data compilation is also part of this component. *Plan* addresses the development of collaborative, inclusive and science-based conservation

strategies and policies. The cornerstone is the approach developed by the SSC Conservation Planning Specialist Group [27]. *Act* refers to convening and mobilizing conservation actions to improve the status of biodiversity. *Network* enhances and supports collaboration and capacity building among experts, in particular, the SSC network and its partners, to deliver conservation priorities identified within the IUCN Species Strategic Plan (IUCN Species Strategic Plan 2021–2025 (https://www.iucn.org/our-union/commissions/species-survival-commission/our-work/iucn-species-strategic-plan), accessed on 23 August 2022). *Communicate* aims to drive strategic and targeted communications to enhance the impact of species conservation initiatives.
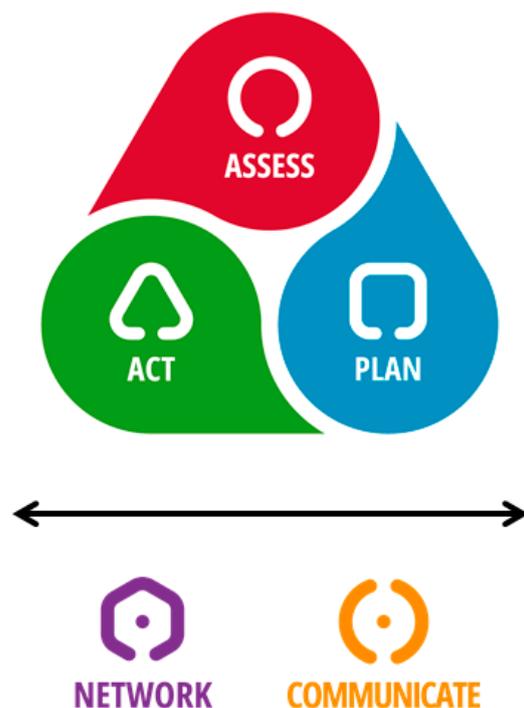

Figure 2. The Species Conservation Cycle has three components that follow each other—Assess, Plan and Act—and two more that are transversal to all—Network and Communicate.

In current SSC practice, when we move along the Species Conservation Cycle from Assess to Plan to Act, the spatial scale of the activities shifts from global to local. For example, for most SSC taxonomic groups, a primary goal is to contribute extinction risk assessments to the *IUCN Red List of Threatened Species* [28], which by definition span the entire global range of each species. In terms of planning for recovery, sub-global spatial units are identified, and each one is examined separately [29]. When funding is mobilized for implementing conservation action, the spatial dimension of interventions is even more focused. Additionally, Assess is basically an evidence-driven exercise, Plan draws evidence into consultations that are both technical and socio-political, and Act depends hugely on the engagement of national and local governments, among other stakeholders [13]. Recognizing these differences in spatial scale and institutional engagement along the flow of the Species Conservation Cycle has led us to remember that our work under Assess best improves species and ecosystems if we also Plan and Act at appropriate geo-political scales, and particularly at the national level.

3. Bolstering Conservation Action at the National Level

As the SSC has members in 173 countries, we could generate a natural pool of species conservation expertise at the national level by mobilizing and empowering our network. This has the added benefit that, as the SSC is an expert network focused on evidence-based conservation, the scientific advice provided is independent of nations' political agendas.

A new SSC structure, National Species Specialist Groups (NSSGs) that organize species experts at the national level and allows the involvement of IUCN member institutions was established in 2022. In order to address the biodiversity paradox, NSSGs are being set up in developing nations and have three broad objectives. The first is to support the implementation of knowledge products mobilized by IUCN at the national level [26]. Primarily devoted to integrating red lists of species and ecosystems, green status, and key biodiversity areas to inform conservation policies, in order to strengthen the science that underlies decision-making at a national level. The second is to work closely with national governments in coordinating the SSC's expertise to ensure species conservation requirements are integrated into spatial biodiversity planning, protected area expansion, environmental authorizations and legal regulations to protect species. The third is to create opportunities for emerging conservation talent at the national level to join the SSC. It is usually difficult for young professionals to be invited to join an SSC group, as this often requires having achieved a high level of scientific impact globally. NSSGs offer a platform for young scientists, who are having a significant impact locally but may not yet be players internationally, to join the SSC and become active members of the network. Once emerging young scientists become part of the SSC, they have access to experts with many years of experience working at the global scale, and through the structured processes of scientific review required in the generation of all IUCN-linked knowledge products a natural transfer of capacity between long-standing members of the SSC and emerging experts based in NSSG takes place. Thus far, NSSGs have been established in China and Colombia, and are being piloted in Indonesia, Kenya, Madagascar and South Africa.

In parallel with creating NSSGs, the SSC is working with partners to establish Centers for Species Survival (CSS). The CSSs (now numbering 10) employ and empower dedicated staff teams, anchored in the partner institution, to catalyze collaboration among experts, local communities, national governments, and civil society organizations, even as they help strengthen local professional capacity in the partner institution. These CSSs support and amplify species conservation by identifying priority gaps and ensuring that efforts, resources and experts are effectively connected. One of the CSSs has a global focus while the others are delimited by geography, theme, or both [30,31]. The Global Center for Species Survival is a partnership with the Indianapolis Zoological Society and provides overall support and strengthens the SSC taxon-focused Specialist Groups [32,33]. National and regional CSSs have been established in Argentina (Fundación Temaikèn), Australia (Zoo and Aquarium Association), Brazil (Parque Das Aves) [34], Portugal (Oceanário de Lisboa), Singapore (Mandai Nature), the United Kingdom (The Deep Aquarium and Paradise Wildlife Park), and the United States (Albuquerque Biopark and Georgia Aquarium) (Figure 3). Combined, they contribute 26 staff to help achieve the Species Conservation Cycle around the world.

By including methods for evaluating and monitoring the performance of NSSGs, the GCSS and CSSs from the outset, the SSC will systematically track how they mobilize expertise and collaboration, identify strengths and weaknesses, and foster adaptation. Thus, they could provide a road map to better articulate experts, institutions, and funding. Recent evaluations on how conservation communities collaborate (e.g., [35,36]) have focused on the Global North, and have a narrow taxonomic scope or research topic. Evaluating collaboration of conservation networks in a decentralized community of science-policy researchers such as the SSC would be anchored at the spatial scale where conservation interventions and policies occur. It would also acknowledge the intersectoral flow of the Species Conservation Cycle.

Figure 3. Distribution of SSC Centers for Species Survival.

North-south and south-south collaborations can be a powerful tool to alleviate the biodiversity paradox and inform conservation policies. Such partnerships can enable teams of conservationists from developed countries to focus on similar interests to strengthen conservation capacities in developing countries. While those from the Global North may have advanced technical training, they are often poorly anchored in the realities of applying knowledge to generate conservation action. In turn, colleagues from the Global South commonly have an advanced understanding of conservation challenges and realities while seeking more technical tools. NSSGs and CSSs are intended to support. Likewise, they enable conservationists from the Global South to contribute to their home countries as part of an international network. One example to demonstrate this is the French Development Agency (AFD) and French Facility for Global Environment (FFEM) who, in June 2022, committed five years of funding to conduct national red lists of species and ecosystems, identify key biodiversity areas, and produce integrated biodiversity spatial plans for four African countries: Malawi, Mozambique, Namibia and South Africa. This partnership has been facilitated by the South African National Biodiversity Institute (SANBI) and BirdLife South Africa as part of their work within the SSC (South-South collaboration). Additional guidance and training will be provided by the French Biodiversity Agency (OFB) (North-South collaboration). Many such partnerships already exist globally but further opportunities exist for twinning institutions in the Global North and those in the Global South to foster technical and scientific transfer and will need to be rapidly established if we are to meet the targets of the post-2020 Global Biodiversity Framework.

The key for interactions and partnerships to be effective is if they are equitable, aim at strengthening national and local efforts, are designed collaboratively and bottom/up, where credits and funding are fairly shared, and intellectual property (in all its diversity) is appropriately recognized [37,38]. These partnerships should, above all, enhance the capacity and contributions of local institutions and teams; they are the colleagues actively

engaged in addressing the long-term political, economic and social challenges inherent in all conservation issues.

4. Conclusions

National Biodiversity Strategies and Action Plans are instruments developed and updated by governments to guide participatory engagement in the post-2020 Global Biodiversity Framework [3]. Our goal here has been to highlight how the existing SSC expert network, configured as NSSGs, and our partnerships with the CSS teams can collaborate with national governments to strengthen, expand, mobilize and articulate human, institutional and financial resources that build on existing infrastructure. Greater emphasis on empowering our networks at the national level would achieve the double objective of mobilizing contributions to reverse trends in biodiversity decline and providing evidence-based advice to governments that drive conservation action worldwide.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/d14090708/s1.

References

1. Anonymous. Biodiversity faces its make-or-break year. *Nature* **2022**, *601*, 298. [CrossRef] [PubMed]
2. Díaz, S.; Settele, J.; Brondízio, E.S.; Ngo, H.T.; Agard, J.; Arneth, A.; Balvanera, P.; Brauman, K.A.; Butchart, S.H.M.; Chan, K.M.A.; et al. Pervasive human-driven decline of life on Earth points to the need for transformative change. *Science* **2019**, *366*, eaax3100. [CrossRef] [PubMed]
3. CBD. *Expert Input to the Post-2020 Global Biodiversity Framework: Transformative Actions on All Drivers of Biodiversity Loss Are Urgently Required to Achieve the Global Goals by 2050*; Convention on Biological Diversity (CBD/WG2020/3/INF/11, CBD/SBSTTA/24/INF/31): Montreal, QC, Canada, 2022.
4. Rounsevell, M.D.A.; Harfoot, M.; Harrison, P.A.; Newbold, T.; Gregory, R.D.; Mace, G.M. A biodiversity target based on species extinctions. *Science* **2020**, *368*, 1193–1195. [CrossRef] [PubMed]
5. CBSG. *Second Nature: Changing the Future for Endangered Species*; Conservation Breeding Specialist Group (CBSG): St. Paul, MN, USA, 2017; p. 85.
6. Mittermeier, R.A.; Rylands, A.B.; Sechrest, W.; Langhammer, P.F.; Mittermeier, J.C.; Parr, M.J.; Konstant, W.R.; Mast, R.B. *Back from the Brink*; CEMEX & Earth in Focus, Inc.: Qualicum Beach, BC, Canada, 2017; p. 273.
7. IPBES. *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*; Brondizio, E.S., Settele, J., Díaz, S., Ngo, H.T., Eds.; IPBES Secretariat: Bonn, Germany, 2019; p. 1148.
8. Hoffmann, M.; Hilton-Taylor, C.; Angulo, A.; Böhm, M.; Brooks, T.M.; Butchart, S.H.M.; Carpenter, K.E.; Chanson, J.; Collen, B.; Cox, N.A.; et al. The Impact of Conservation on the Status of the World's Vertebrates. *Science* **2010**, *330*, 1503–1509. [CrossRef]

9. Bolam, F.C.; Mair, L.; Angelico, M.; Brooks, T.M.; Burgman, M.; Hermes, C.; Hoffmann, M.; Martin, R.W.; McGowan, P.J.K.; Rodrigues, A.S.L.; et al. How many bird and mammal extinctions has recent conservation action prevented? *Conserv. Lett.* **2021**, *14*, e12762. [CrossRef]

10. Young, R.P.; Hudson, M.A.; Terry, A.M.R.; Jones, C.G.; Lewis, R.E.; Tatayah, V.; Zuël, N.; Butchart, S.H.M. Accounting for conservation: Using the IUCN Red List Index to evaluate the impact of a conservation organization. *Biol. Conserv.* **2014**, *180*, 84–96. [CrossRef]

11. Hughes, A.C.; Orr, M.C.; Ma, K.; Costello, M.J.; Waller, J.; Provoost, P.; Yang, Q.; Zhu, C.; Qiao, H. Sampling biases shape our view of the natural world. *Ecography* **2021**, *44*, 1259–1269. [CrossRef]

12. Troudet, J.; Grandcolas, P.; Blin, A.; Vignes-Lebbe, R.; Legendre, F. Taxonomic bias in biodiversity data and societal preferences. *Sci. Rep.* **2017**, *7*, 9132. [CrossRef]

13. Rodríguez, J.P. Reverse the Red: Achieving global biodiversity targets at national level. *Oryx* **2021**, *55*, 1–2. [CrossRef]

14. Gaston, K.J. Global patterns in biodiversity. *Nature* **2000**, *405*, 220–227. [CrossRef]

15. Willig, M.R.; Kaufman, D.M.; Stevens, R.D. Latitudinal Gradients of Biodiversity: Pattern, Process, Scale, and Synthesis. *Annu. Rev. Ecol. Evol. Syst.* **2003**, *34*, 273–309. [CrossRef]

16. Lees, A.C.; Haskell, L.; Allinson, T.; Bezeng, S.B.; Burfield, I.J.; Renjifo, L.M.; Rosenberg, K.V.; Viswanathan, A.; Butchart, S.H.M. State of the World's Birds. *Annu. Rev. Environ. Resour.* **2022**, *47*. [CrossRef]

17. Tittensor, D.P.; Mora, C.; Jetz, W.; Lotze, H.K.; Ricard, D.; Berghe, E.V.; Worm, B. Global patterns and predictors of marine biodiversity across taxa. *Nature* **2010**, *466*, 1098–1101. [CrossRef] [PubMed]

18. Jefferson, T.; Costello, M.J.; Zhao, Q.; Lundquist, C.J. Conserving threatened marine species and biodiversity requires 40% ocean protection. *Biol. Conserv.* **2021**, *264*, 109368. [CrossRef]

19. Navarro, L.M.; Fernández, N.; Guerra, C.; Guralnick, R.; Kissling, W.D.; Londoño, M.C.; Muller-Karger, F.; Turak, E.; Balvanera, P.; Costello, M.J.; et al. Monitoring biodiversity change through effective global coordination. *Curr. Opin. Environ. Sustain.* **2017**, *29*, 158–169. [CrossRef]

20. Schmeller, D.S.; Böhm, M.; Arvanitidis, C.; Barber-Meyer, S.; Brummitt, N.; Chandler, M.; Chatzinikolaou, E.; Costello, M.J.; Ding, H.; García-Moreno, J.; et al. Building capacity in biodiversity monitoring at the global scale. *Biodivers. Conserv.* **2017**, *26*, 2765–2790. [CrossRef]

21. Heberling, J.M.; Miller, J.T.; Noesgaard, D.; Weingart, S.B.; Schigel, D. Data integration enables global biodiversity synthesis. *Proc. Natl. Acad. Sci. USA* **2021**, *118*, e2018093118. [CrossRef]

22. Secretariat of the Convention on Biological Diversity. *Global Biodiversity Outlook 5*; Secretariat of the Convention on Biological Diversity: Montreal, QC, Canada, 2020; p. 208.

23. CBD High-Level Panel. *Resourcing the Aichi Biodiversity Targets: An Assessment of Benefits, Investments and Resource Needs for Implementing the Strategic Plan for Biodiversity 2011–2020*; Second Report of the High-Level Panel on Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011–2020; CBD: Montreal, QC, Canada, 2014; p. 122.

24. UBS. *Seeds of Change: A Guide for Philanthropists and Changemakers to Protect Biodiversity and All Life on Land*; UBS Group AG: Zurich, Switzerland, 2021; p. 111.

25. Stuart, S.N.; Al Dhaheri, S.; Bennett, E.L.; Biggs, D.; Bignell, A.; Byers, O.; Cooney, R.; Donaldson, J.; Dublin, H.T.; Eggermont, H.; et al. IUCN's encounter with 007: Safeguarding consensus for conservation. *Oryx* **2019**, *53*, 741–747. [CrossRef]

26. Brooks, T.M.; Butchart, S.H.M.; Cox, N.A.; Heath, M.; Hilton-Taylor, C.; Hoffmann, M.; Kingston, N.; Rodríguez, J.P.; Stuart, S.N.; Smart, J. Harnessing biodiversity and conservation knowledge products to track the Aichi Targets and Sustainable Development Goals. *Biodiversity* **2015**, *16*, 157–174. [CrossRef]

27. CPSG. *Species Conservation Planning Principles & Steps, Ver. 1.0*; IUCN/SSC Conservation Planning Specialist Group: Apple Valley, MN, USA, 2020; p. 39.

28. IUCN. IUCN Red List of Threatened Species; Version 2021-3. Available online: http://www.iucnredlist.org (accessed on 6 July 2021).

29. IUCN. *IUCN Green Status of Species: A Global Standard for Measuring Species Recovery and Assessing Conservation Impact*; Version 2.0; IUCN: Gland, Switzerland, 2021; p. 25.

30. Mileham, K.; Gray, J.; Byers, O.; Duke, K.; Whitnall, L.; Baylina, N.; Rugg, J.M.; Shumaker, R.; Dove, A.; Croukamp, C.; et al. Zoos and Aquariums as Centres for Species Survival: Leadership in Practice. *WAZA News* **2021**, *2021*, 9–11.

31. Mileham, K.; Gray, J.; Byers, O. Zoos and Aquariums as Centres for Species Survival. *WAZA News* **2021**, *2021*, 5–8.

32. Kessler, M.; Böhm, M.; Griese, K.; Pollom, R.A.; Canteiro, C.; Henriques, S.; Roach, N.; Yang, A.; Street, W.; Rodríguez, J.P. New Global Center for Species Survival launches programme of work. *Oryx* **2021**, *55*, 816–817. [CrossRef]

33. Street, B.; Mileham, K. The First-ever Global Center for Species Survival at the Indianapolis Zoo. *WAZA News* **2021**, *2021*, 5–7.

34. Rocha, F.L.; Cordero-Schmidt, E.; Subirá, R.; Croukamp, C.; Jerusalinsky, L.; Marchini, S.; Ferraz, K.; Barros, Y.; Desbiez, A.; De Andrade, N.; et al. Center for Species Survival Brazil. *Oryx* **2021**, *55*, 496. [CrossRef]

35. Claudel, M.; Massaro, E.; Santi, P.; Murray, F.; Ratti, C. An exploration of collaborative scientific production at MIT through spatial organization and institutional affiliation. *PLoS ONE* **2017**, *12*, e0179334. [CrossRef]

36. Aleixandre-Benavent, R.; Aleixandre-Tudó, J.L.; Castelló-Cogollos, L.; Aleixandre, J.L. Trends in global research in deforestation. A bibliometric analysis. *Land Use Policy* **2018**, *72*, 293–302. [CrossRef]

37. Rodríguez, J.P.; Taber, A.B.; Daszak, P.; Sukumar, R.; Valladares-Padua, C.; Padua, S.; Aguirre, L.F.; Medellín, R.A.; Acosta, M.; Aguirre, A.A.; et al. Globalization of conservation: A view from the south. *Science* **2007**, *317*, 755–756. [CrossRef]
38. Smith, R.J.; Veríssimo, D.; Leader-Williams, N.; Cowling, R.M.; Knight, A.T. Let the locals lead. *Nature* **2009**, *462*, 280–281.